Please provide the following information, and submit to the NOAA DM Plan Repository.

Reference to Master DM Plan (if applicable)

As stated in Section IV, Requirement 1.3, DM Plans may be hierarchical. If this DM Plan inherits provisions from a higher-level DM Plan already submitted to the Repository, then this more-specific Plan only needs to provide information that differs from what was provided in the Master DM Plan.

URL of higher-level DM Plan (if any) as submitted to DM Plan Repository:

1. General Description of Data to be Managed

   1.1. Name of the Data, data collection Project, or data-producing Program:
   2012 OLC Bathymetric Lidar DEM: Sandy River (OR)

   1.2. Summary description of the data:
   Airborne topobathymetric lidar point cloud collected for the Sandy River, Oregon in 2012.

   The Sandy River flows through areas of steep terrain and dense tree canopy and is home to Chinook and Coho salmon and Steelhead trout. The Sandy River is further distinguished by the 2007 removal of the Marmot Dam (river mile 30) and has been the focus of ongoing monitoring to understand the impacts of dam removal on downstream morphology and fish habitat. The nature of the river makes it challenging for traditional transect or boat-based bathymetric surveys.

   1.3. Is this a one-time data collection, or an ongoing series of measurements?
   One-time data collection

   1.4. Actual or planned temporal coverage of the data:
   2012-09-22

   1.5. Actual or planned geographic coverage of the data:
   W: -122.410523, E: -121.934087, N: 45.57894, S: 45.336942
   Area includes the Sandy River and a buffer of land around it.

   1.6. Type(s) of data:
   (e.g., digital numeric data, imagery, photographs, video, audio, database, tabular data, etc.)
   Model (digital)

   1.7. Data collection method(s):
   (e.g., satellite, airplane, unmanned aerial system, radar, weather station, moored buoy, research vessel, autonomous underwater vehicle, animal tagging, manual surveys, enforcement activities, numerical model, etc.)

   1.8. If data are from a NOAA Observing System of Record, indicate name of system:

1.8.1. If data are from another observing system, please specify:

2. Point of Contact for this Data Management Plan (author or maintainer)

2.1. Name:
Office for Coastal Management (OCM)

2.2. Title:
Metadata Contact

2.3. Affiliation or facility:
Office for Coastal Management (OCM)

2.4. E-mail address:

2.5. Phone number:

3. Responsible Party for Data Management
Program Managers, or their designee, shall be responsible for assuring the proper management of the data produced by their Program. Please indicate the responsible party below.

3.1. Name:

3.2. Title:
Data Steward

4. Resources
Programs must identify resources within their own budget for managing the data they produce.

4.1. Have resources for management of these data been identified?

4.2. Approximate percentage of the budget for these data devoted to data management (specify percentage or "unknown"):

5. Data Lineage and Quality
NOAA has issued Information Quality Guidelines for ensuring and maximizing the quality, objectivity, utility, and integrity of information which it disseminates.

5.1. Processing workflow of the data from collection or acquisition to making it publicly accessible
(describe or provide URL of description):
Lineage Statement:

Lidar was flown from two instruments over the Sandy River in Oregon. Data were processed to point clouds and classified as ground or unclassified.

Process Steps:

- 2012-01-01 00:00:00 - Planning: The airborne survey was designed to collect a point density of 4-5 pulses/m2 for the topo-bathymetric LiDAR. The flight was planned with a scan angle of ±20o and 50% side-lap. The 50% side-lap was used to ensure uniform coverage and to minimize laser shadowing due to vegetation and terrain. The flights were conducted in the late fall during base flow conditions to maximize water clarity and ensure shallow depths (Figure 2). The flight lines were developed using ALTM-NAV Planner (v.3.0) software and Leica Mission Pro Flight Planning and Evaluation (FPES) software. Efforts were taken to optimize flight paths by minimizing flight times while meeting all accuracy specifications. The WSI acquisition staff considered all factors such as air space restrictions, private property access, and GPS quality in the planning of this mission.

- 2012-01-01 00:00:00 - Lidar Survey: Two lidar instruments were flown. A Riegel VQ-820-Q for bathymetric collection and a Lieca ALS60 for topographic collection. The Riegl VQ-820-G uses a green-wavelength (μ = 532 nm) laser that, in addition to collecting vegetation and topography data, is able to penetrate the water surface with the 532-nm wavelength which provides for minimal spectral absorption. The sensor also collects both discrete returns (similar to the NIR data) and full-waveform data (every other pulse) for more rigorous feature extraction and evaluation of point returns. The recorded waveform enables range measurements for all discernible targets for a given pulse. The typical number of returns digitized from a single pulse ranged from 1 to 7 for the Sandy River project area.   The Leica ALS60 uses a NIR wavelength (μ =1,064nm) laser that has been proven to provide high value terrestrial topography data. The NIR wavelengths do not penetrate the water column and thus provide water surface returns for received pulses off of water surface. The Leica system collects 8-bit intensity information and does not store waveform information.   To accurately solve for laser point position (geographic coordinates x, y, and z), the positional coordinates of the airborne sensor and the attitude of the aircraft were recorded continuously throughout the LiDAR data collection mission. Position of the aircraft was measured twice per second (2 Hz) by an onboard differential GPS unit. Aircraft attitude was measured 200 times per second (200 Hz) as pitch, roll, and yaw (heading) from an onboard inertial measurement unit (IMU). To allow for post-processing correction and calibration, aircraft/sensor position and attitude data are indexed by GPS time.

- 2012-01-01 00:00:00 - Lidar Processing: Prior to the mission, a boresight calibration flight was conducted in Corvallis, OR and processed by WSI to ensure accurate initial sensor alignment. An individual mission calibration was also performed on the Sandy River data set using Riegl's RiProcess software. RiProcess was then used by WSI to further refine line-to-line calibration of the topo-bathymetric LiDAR dataset to match collected hard surface RTK control points. Upon completion of calibration, Dewberry processed the LiDAR returns with a combination of manual and automated techniques using both the Riegl software

and in-house proprietary software to differentiate the bathymetric and terrestrial data. WSI processed NIR LiDAR and the orthorectified digital imagery, which were also used to facilitate the processing of the bathymetric returns. Once bathymetric points were differentiated, they were spatially corrected for refraction through the water column based on the angle of incidence of the laser. Dewberry refracted water column points and classified the resulting point cloud. The resulting data was sent back to WSI for further review and product creation. Figure 4 shows the various datasets used in the bathymetric analysis while Table 7 summarizes the steps used to process the bathymetric LiDAR data.

- 2012-01-01 00:00:00 - Point Classification: As with standard NIR LiDAR data, bathymetric (green) LiDAR returns are classified into categories according to whether the points are considered above ground, ground, or water. Additional LiDAR classifications were created for bathymetric processing by adding categories for channel bottom, water surface, and water column points.

- 2012-01-01 00:00:00 - Full Waveform Processing: Initial echo analysis is accomplished with Riegl's online waveform processing. In online waveform processing, discrete returns are digitized from the echo signal based on the amplitude and pulse deviation of returning energy. To facilitate discrimination of ground points versus water column points and bathymetry points, the Riegl VQ-820-G uses the online waveform processing system that generates a discrete point cloud dataset at time of capture ("online") from the full waveform signal. The system also records geo-referenced waveforms for a subsample of the data (configured for every other pulse). The waveforms are used in determining accurate bathymetry in shallow submerged environments. The separation of the water surface and bottom return in shallow depths requires further analysis and customized methods to ' decompose' or 'deconvolve' the waveform. Furthermore, certain parameters such as attenuation coefficients need to be set when processing data in various depth ranges and water column parameters. Information derived from the waveforms is used to set these parameters. The determination of the bottom return also needs to be corrected for the change in speed of light through the water column and the refraction of light at the air/water interface. The processed waveforms are used to validate the online digitization of the initial point cloud data.

- 2019-03-22 00:00:00 - The NOAA Office for Coastal Management received the lidar data from the Oregon Lidar Consortium. There were two sets of DEMs, one labeled as bare earth and one labeled as topobathy. They cover the same area, but the topobathy set appears to have more noise and/or variance. Only the bare earth DEMs were kept.   The data report indicates that the data were collected and delivered in NAD83(CORS96) UTM Zone 10. The GeoTiff files indicated NAD83(HARN) UTM Zone 10. The data report is believed to be correct. The data were likely coded with HARN because there was no EPSG code for CORS96 UTM Zone 10 to use for the encoding. Note that the metadata system housing this metadata does not have either the HARN or CORS96 UTM Zone 10 codes, so the closest option (NSRS2007) was used in the metadata.   Metadata was not delivered with the data. This metadata was created from the WSI report. (Citation: DEM files)

5.1.1. If data at different stages of the workflow, or products derived from these data, are subject to a separate data management plan, provide reference to other plan:

5.2. Quality control procedures employed (describe or provide URL of description):

6. Data Documentation
The EDMC Data Documentation Procedural Directive requires that NOAA data be well documented, specifies the use of ISO 19115 and related standards for documentation of new data, and provides links to resources and tools for metadata creation and validation.

6.1. Does metadata comply with EDMC Data Documentation directive?
No

6.1.1. If metadata are non-existent or non-compliant, please explain:
Missing/invalid information:
- 1.7. Data collection method(s)
- 2.4. Point of Contact Email
- 3.1. Responsible Party for Data Management
- 4.1. Have resources for management of these data been identified?
- 4.2. Approximate percentage of the budget for these data devoted to data management
- 5.2. Quality control procedures employed
- 7.1. Do these data comply with the Data Access directive?
- 7.1.1. If data are not available or has limitations, has a Waiver been filed?
- 7.1.2. If there are limitations to data access, describe how data are protected
- 7.3. Data access methods or services offered
- 7.4. Approximate delay between data collection and dissemination
- 8.1. Actual or planned long-term data archive location
- 8.3. Approximate delay between data collection and submission to an archive facility
- 8.4. How will the data be protected from accidental or malicious modification or deletion prior to receipt by the archive?

6.2. Name of organization or facility providing metadata hosting:
NMFS Office of Science and Technology

6.2.1. If service is needed for metadata hosting, please indicate:

6.3. URL of metadata folder or data catalog, if known:
https://www.fisheries.noaa.gov/inport/item/56855

6.4. Process for producing and maintaining metadata
(describe or provide URL of description):

Metadata produced and maintained in accordance with the NOAA Data Documentation Procedural Directive: https://nosc.noaa.gov/EDMC/DAARWG/docs/EDMC_PD-Data_Documentation_v1.pdf

7. Data Access
NAO 212-15 states that access to environmental data may only be restricted when distribution is explicitly limited by law, regulation, policy (such as those applicable to personally identifiable information or protected critical infrastructure information or proprietary trade information) or by security requirements. The EDMC Data Access Procedural Directive contains specific guidance, recommends the use of open-standard, interoperable, non-proprietary web services, provides information about resources and tools to enable data access, and includes a Waiver to be submitted to justify any approach other than full, unrestricted public access.

7.1. Do these data comply with the Data Access directive?

7.1.1. If the data are not to be made available to the public at all, or with limitations, has a Waiver (Appendix A of Data Access directive) been filed?

7.1.2. If there are limitations to public data access, describe how data are protected from unauthorized access or disclosure:

7.2. Name of organization of facility providing data access:
Office for Coastal Management (OCM)

7.2.1. If data hosting service is needed, please indicate:

7.2.2. URL of data access service, if known:
https://coast.noaa.gov/dataviewer/#/lidar/search/where:ID=8696
https://coast.noaa.gov/htdata/raster2/elevation/OLC_sandy_river_dem_2012_8696

7.3. Data access methods or services offered:

7.4. Approximate delay between data collection and dissemination:

7.4.1. If delay is longer than latency of automated processing, indicate under what authority data access is delayed:

8. Data Preservation and Protection
The NOAA Procedure for Scientific Records Appraisal and Archive Approval describes how to identify, appraise and decide what scientific records are to be preserved in a NOAA archive.

8.1. Actual or planned long-term data archive location:

(Specify NCEI-MD, NCEI-CO, NCEI-NC, NCEI-MS, World Data Center (WDC) facility, Other, To Be Determined, Unable to Archive, or No Archiving Intended)

> **8.1.1. If World Data Center or Other, specify:**

> **8.1.2. If To Be Determined, Unable to Archive or No Archiving Intended, explain:**

8.2. Data storage facility prior to being sent to an archive facility (if any):
Office for Coastal Management - Charleston, SC

8.3. Approximate delay between data collection and submission to an archive facility:

8.4. How will the data be protected from accidental or malicious modification or deletion prior to receipt by the archive?
Discuss data back-up, disaster recovery/contingency planning, and off-site data storage relevant to the data collection

9. Additional Line Office or Staff Office Questions
Line and Staff Offices may extend this template by inserting additional questions in this section.